

CLAIMS

We claim:

1. A magnetic separator comprising:

an elongated tank having a bottom wall, a pair of side walls connected to said bottom wall, a front wall connected to said bottom and side walls at one end of said tank and a ramp wall at the other end of said tank extending upwardly from said bottom wall and in a direction away from said front wall to form an upwardly and outwardly inclined ramp having the edges thereof connected to said side walls;

an inlet provided in a wall of said tank for directing liquids containing ferrous particles and other particulate into said tank;

an outlet provided in a wall of said tank where the liquid after treatment exits said tank;

a track system mounted in and extending lengthwise of said tank including a lower tank track, an upper tank track spaced above said lower tank track, a lower ramp track and an upper ramp track spaced above said lower ramp track;

a pair of transversely spaced apart endless conveyor chains movably mounted in said tank and guided by said track system, said conveyor chains describing an endless loop within said tank;

a plurality of longitudinally spaced magnetic frames in said tank, each frame extending across said tank between said side walls and having an upper end and a lower end, with said upper end of each frame suspended from said conveyor chains;

each of said frames carrying a series of parallel magnetic rods which are spaced apart to form magnetic gaps and through which the liquid passes as the conveyor chains and frames traverse said tank, with the ferrous particles in the liquid being attracted to and deposited on said magnetic rods;

the lower end of each frame being provided with a scraper edge that contacts the bottom and ramp walls of the tank when the frame is traversing the lower tracks to scrape the particulate from the bottom and ramp walls and move the particulate towards the other end of said tank where it is discharged;

each frame as it leaves said lower tank track and enters said lower ramp track closely follows the inclination of said ramp as the frame travels up said ramp;

wiper blades located near the upper end of said ramp, each frame as it is moved by said conveyor chains up said ramp engaging a trip lever which opens said wiper blades;

each frame as it is moved by said conveyor chains after the top thereof has passed said trip lever moving through the opening between said wiper blades, said wiper blades thereafter closing on the magnetic rods of said frame to wipe and remove the collected ferrous particulate from the magnetic rods;

the lower end of each frame as it is moved by said conveyor chains and approaches said wiping blades causing a protrusion thereon to make contact with said trip lever resulting in the wiper blades opening to thereby allow the lower end thereof to pass through the openings; and

a pivoted switch track which is normally closed interposed between said upper and lower ramp tracks, said switch track opening when contacted by each frame as it is swung upwards and forward, said switch track after each frame has cleared the opening falling back and forcing it to follow said upper ramp and tank tracks.

2. The magnetic separator as defined in claim 1, wherein said inlet is provided in said front wall near the bottom wall; and a baffle is mounted in said tank opposite said inlet, said baffle extending from one side wall of the tank to the other for reducing the velocity of the incoming liquid and distributing the liquid evenly across the width of the tank.

3. The magnetic separator of claim 1, wherein said outlet is located at the opposite end of the tank from said inlet; and an overflow trough in said tank forming a dam, said trough being as wide as said tank, the fluid after treatment in said tank overflowing said dam and exiting said trough through said outlet.

4. The magnetic separator of claim 1 wherein said lower tank and ramp tracks are provided with a guard vertically spaced in said tank and ramp tracks to assist in maintaining the conveyor chains on the tank and ramp tracks.

5. The magnetic separator defined in claim 1, wherein each magnetic rod includes a tube closed at opposite ends and having therein a plurality of bar magnets and pole pieces which are stacked in end-to-end abutting relationship.

6. The magnetic separator as defined in claim 1, wherein said magnetic frames each comprises an elongated tubular member having a pair of outwardly facing end surfaces, said tubular member forming the upper end of said frame and having a longitudinally

extending axis, an elongated tube support spaced from and parallel to said tubular member and forming the lower end of said frame, a pair of longitudinally spaced side supports near the end portions of said tubular member and tube support, said side support having the edges thereof connected to said tubular member and to said side supports, said series of magnetic rods comprising spaced tubes carried by said tube support between said side supports; and a plurality of bar magnets and pole pieces stacked in end-to-end abutting relationship in each of said tubes between said box tubular member and said tube support.

7. The magnetic separator of claim 6, wherein a tubular pipe extends through said box tubular member of each frame, said pipe and having end portions extending beyond the end surfaces of said tubular member, said tubular pipe having the ends connected to said conveyor chains.

8. The magnetic separator of claim 6, wherein said scraper edge of each frame forms part of said tube support, said scraper edge being inclined at approximately a 60° angle to the plane of said frame.

9. The magnetic separator of claim 6, wherein said tube support is provided with a plurality of nipples which are spaced apart, said nipples fitting into the inside of the tubes containing said bar magnetics and pole pieces.

10. The magnetic separator of claim 6, wherein a pair of guide pins are attached to the lower edges of the side supports of each of said magnetic bar frames.

11. The magnetic separator of claim 6, wherein a pair of lift pins are attached to the lower edges of said tube support.

12. The magnetic separator of claim 6, wherein each frame includes an elongated plate having a plurality of holes, with the holes spaced apart the same distance as the spacing between said parallel tubes, said holes permitting said magnetic bars to be inserted into said tubes during the assembly of the frame.

13. The magnetic separator of claim 1, wherein said track system is mounted along each of said side walls.

14. The magnetic separator of claim 13, wherein one of said endless conveyor chain moves in the track system along one side wall and the other of said endless conveyor chains moves in the track system along the other side wall.

15. The magnetic separator of claim 1, wherein means are provided for moving said conveyor chains in an endless path along said track system.

16. The magnetic separator of claim 15, wherein said conveyor chains moving means comprising a pair of rotary sprockets meshed with said conveyor chains, one sprocket for each conveyor chain, a drive shaft connecting said sprockets, and power means having a drive connection with said drive shaft.

17. The magnetic separator of claim 16, in which said tank has a liquid level and including means for supporting said sprockets above said liquid level.

18. The magnetic separator of claim 16, wherein said drive shaft is rotatable on a horizontal axis that extends transverse to the side walls of said tank.

19. The magnetic separator of claim 1, said magnetic frames are suspended between said conveyor chains in a manner allowing said frames to swivel and to hang freely as the chains follows its endless path.

20. The magnetic separator of claim 1, wherein a pair of trip levers are provided, each trip lever having a wiper cam attached thereto, said trip levers when rotated by the moving frame causing the cam to rotate and force the wiper blades apart.

21. The magnetic separator of claim 20, wherein springs are provided between each wiper blade and wiper cam for biasing said wiper blades to the closed position.

22. The magnetic separator of claim 16, wherein said power means maybe be operated continuously or intermittently where one of the magnetic frames on the upper tank track is positioned directly above a frame on the lower tank track thereby allowing the frames

to dwell, without moving, while allowing the liquid to flow through the magnetic gaps of the frames, with the magnetic rods attracting the ferrous particles.

23. A magnetic bar frame comprising:

(a) an elongated tubular member forming the upper end of said frame and having a pair of outwardly facing end surfaces, said tubular member having a longitudinally extending axis;

(b) an elongated tube support spaced from and arranged parallel to said tubular member and forming the lower end of said frame;

(c) a pair of longitudinally spaced side supports near the end portions of said tubular member and tube support, said side supports having the edges thereof connected to said tubular member and to said tube support;

(d) a plurality of longitudinally spaced tubes carried by said tube support between said side supports; and

(e) a plurality of bar magnets and pole pieces stacked in end-to-end abutting relationship in each of said tubes between said tubular member and said tube support;

24. The magnetic bar frame of claim 23, wherein a tubular pipe extends through said tubular member and having end portions extending beyond the end surfaces of said tubular member.

25. The magnetic bar frame of claim 23, wherein an elongated scraper blade forms part of said tube support, said scraper blade having an edge which is inclined at approximately a 60° angle.

26. The magnetic bar frame of claim 23, wherein said tube support is provided with a plurality of nipples which are spaced longitudinally apart, said nipples fitting into the inside of said tubes.

27. The magnetic bar frame of claim 23, wherein a pair of guide pins are attached to the lower edges of said side supports.

28. The magnetic bar frame of claim 23, wherein a pair of lift pins are attached to said tube support.

29. The magnetic bar frame of claim 23, wherein said frame includes an elongated plate having a plurality of holes, said plate overlying the upper ends of the tubes, said holes permitting said magnetic bars and pole pieces to be inserted into said tubes.

30. The magnetic bar frame of claim 24, wherein the outer end portions of said tubular pipe are attachable to endless conveyor chains.